Lodge Pole Pine

REFERENCE MATERIAL

Pedigree

Institution: Tricon Lumber
Location: Mineral County, MT
Harvested: 2014

Received at INL: 2014
Sample Preparation: Ground 2-inch chips to pass through a 1-inch sieve using a Vermeer BG480 grinder then material was dried in a drum dryer

Composition

Table 1. *Chemical composition[a] of Reference Lodge Pole Pine*

%Structural Ash	%Extractable Inorganics	%Structural Protein	%Extractable Protein	%Water Extracted Glucan[b]
0.27	0.13	0.35	0.06	0.13
%Water Extracted Xylan[b]	**%Water Extractives Others**	**%EtOH Extractives**	**%Lignin**	**%Glucan**
0.04	2.39	1.74	30.50	41.37
%Xylan	**%Galactan**	**%Arabinan+Mannan[c]**	**%Acetic Acid**	**%Total**
5.90	2.84	12.30	1.17	99.18

[a]Determined using NREL "Summative Mass Closure" LAP (NREL/TP-510-48087)

[b]Determined by HPLC following an acid hydrolysis of the water extractives

[c]%Arabinan value includes %mannan, because arabinose and mannose co-elute on the HPLC column

Proximate, Ultimate & Calorimetry

Table 2. *Proximate, ultimate, and calorific values for Reference Lodge Pole Pine (reported on a dry basis)*

Proximate[a]			Ultimate[b]			Calorimetry[c]	
%Volatile	%Ash	%Fixed Carbon	%Hydrogen	%Carbon	%Nitrogen	HHV	LHV
84.50	1.08	14.41	6.06	50.14	Below detection limit	8760	7371

[a]Proximate analysis was done according to ASTM D 5142-09

[b]Ultimate analysis was conducted using a modified ASTM D5373-10 method (Flour and Plant Tissue Method) that uses a slightly different burn profile

[c]Heating values (HHV, LHV) were determined with a calorimeter using ASTM D5865-10

Elemental Ash

Table 3. *Elemental ash composition[a] of Reference Lodge Pole Pine*

%Al as Al_2O_3	%Ca as CaO	%Fe as Fe_2O_3	%K as K_2O	%Mg as MgO	%Mn as MnO	%Na as Na_2O	%P as P_2O_5	%Si as SiO_2	%Ti as TiO_2	%S as SO_3
5.19	10.98	6.87	7.63	3.24	0.53	6.94	1.57	44.26	0.23	3.19

[a]Determined as described in ASTM standards D3174, D3682 and D6349

Particle Characteristics

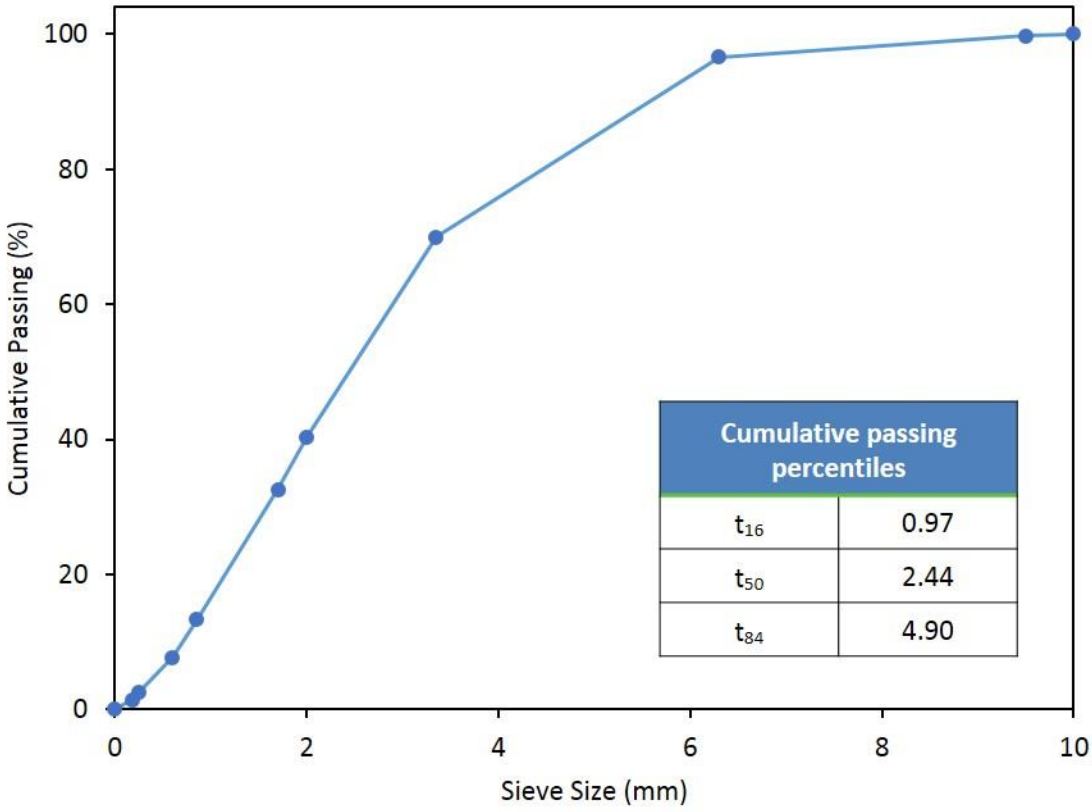

Figure 1. *Cumulative passing percent of 1-inch Reference Lodge Pole Pine determined according to ANSI/ASAE S319.4 using a Ro-Tap test sieve shaker (Model RX-29, W.S. Tyler) and a 15 minute total sieving time. The cumulative passing percentile sieve sizes (e.g., t_{16}) were calculated by interpolation and represent theoretical sieve sizes that would retain 16, 50 or 84% of the particles by mass.*

Contact

For questions regarding biomass material or analytical data please contact Dr. Garold Gresham at garold.gresham@inl.gov or 208-526-6684.